DOCUMENT RESUME

ED 280 731 SE 047 895

AUTHOR Roche, Barbara J.
TITLE Computer-Based Space Shuttle Simulation Teaches Children about the Sciences and Themselves.
PUB DATE 86
NOTE 9p.; Document contains blurred and broken type.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Ecology; Environmental Education; Group Dynamics; Interdisciplinary Approach; Physical Environment; Science Education; *Science Instruction; Science Programs; Secondary Education; *Secondary School Science; *Simulation; *Space Sciences
IDENTIFIERS *Space Shuttle; *Totally Enclosed Modular Environment

ABSTRACT

The space shuttle simulation, Totally Enclosed Modular Environment (TEME), was developed as a means for students to study group dynamics and how people adapt to their environment. This paper highlights features of this project. Topics reviewed include: (1) its historical development (tracing its origins as a year-long ecology course to current adaptations for middle and high school level students); (2) its successes (citing the sources of its acknowledgment); (3) curriculum development efforts (describing the approach and activities involved in an interdisciplinary program); and (4) adaptation efforts (reviewing modifications made to the program). (ML)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.
"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Barbara J. Roche
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ED280731

B.J. Roche
Assistant to the Director of Public Information
Greenfield Community College
Greenfield, Massachusetts 01301
(413) 774-3131, ext. 269

COMPUTER-BASED SPACE SHUTTLE SIMULATION TEACHES CHILDREN ABOUT THE SCIENCES AND THEMSELVES

by B.J. Roche

It's a field trip that is out of this world. The mission of the ninth grade earth science students is to travel thousands of miles to the earth's sister planet, Terra Firma, to gather rock specimens to bring back to their classroom. The ground crew will use computers to guide the spaceship through the galaxy and monitor the well-being of the flight crew. While the flight crew is in space, the group will encounter and examine a comet and launch a satellite which will examine the effects of acid rain on the New England environment.

The "script" for the trip was written by Phil Lussier, a teacher at Mohawk Trail Regional High School in Shelburne, Mass. The launch site is the campus of Greenfield Community College in nearby Greenfield, the home of Project TEME, (Totally Enclosed Modular Environment), a space shuttle simulation designed to study group dynamics and how people adapt to their environments.

SE 047 895

BEST COPY AVAILABLE

TEME's original purpose was to provide college students with a laboratory to study human ecology: people's relationships to their environments and to one another. But as psychology professor Dan LaRose and anthropology professor Gregory Vouros, founders of TEME, adapt the program for use by middle and high school students, they are developing a multidisciplinary, programmable learning environment, using computers, electronics and video effects to teach students about the solar system, the sciences, and not incidentally, themselves and their own approaches to learning.

TEME began in 1979 as a year-long human ecology course which culminated in a three-day simulated space flight each spring. Using computers donated by the ATARI Corporation, and with consulting help from the National Aeronautics and Space Administration (NASA), GCC students built a flight deck mock up and connected it by an air lock to a habitation module which houses six bunks, a microwave oven and a hygiene unit. A two-way communication system connects the orbiter with mission control, and one-way laboratory windows allow the ground control personnel and an audience to observe the activities inside the capsule. The "astronauts" can't see out, adding to the illusion of space flight.

The TEME idea was to provide a closed environment into which "stressors" could be introduced and their effects on people evaluated. The project gave students a chance to learn about human behavior and about collecting and analyzing data.

TEME has won acclaim from educators and computer engineers across the country for its realism and use of computers in learning. It has been featured on the news program "Good Morning America," and has been exhibited at the Pompidou Center in Paris.

This summer the program went public to an audience of middle school students. In adapting the program for use by younger students, Vouros and LaRose are developing TEME into a learning lab that uses "make believe" to promote student cooperation and inject excitement into the sciences.

"This program isn't about learning to fly an orbiter, but it does show the relationships between people's behavior and the success of the mission," says LaRose. "The orbiter is a closed, partially regenerative system that functions as a metaphor for Spaceship Earth. The consequences of how people behave in such a contained environment will be immediately felt, by the environment and by the other people on board."

Lussier spent an entire seven-week school quarter on the simulation, including preparation for the launch, the simulation itself, and a post-trip analysis. Using the theme of "exploration," Lussier developed a curriculum package that uses history, reading and writing, as well as the sciences and astronomy to prepare the students for their trip.

He first introduced students to a post-Civil War explorer, John Wesley Powell, the first director of the United States Geological Survey, who led his men in wooden boats on the first recorded trip down the Colorado River through the Grand Canyon.

"We looked at pictures of the Grand Canyon and the Colorado River, and we read excerpts from Powell's journals, which gave us the sense of what it was like to explore uncharted territories," Lussier says. "Then when we talked about exploration, the subject of space came up. I told them we would be going on a make-believe exploration trip, and that it would take place on many levels."

Students had to write a letter of "application" for the trip, and they were required to keep a daily journal based on the idea of exploration.

"We talked about science and how science works, what scientists do, and what earth science is," says Lussier, "and they began to get curious."

Other subjects and activities resembled preparations for a real trip, including lessons with maps and map reading, working with compasses, and solving logistical problems, such as determining how long it would take to reach a certain destination given a determined speed of travel.

They also learned about space: the solar system and its components, black holes, comets and asteroids and their makeup. In order to monitor the health conditions of the flight crew, students learned about physical testing and charting computer data on the flight crew's blood pressure, pulse and lung capacities.

"A lot of the kids had seen 'The Right Stuff,' and the collection and analysis of data was along that idea," Lussier says.

While previous TEME expeditions have been continuous 72-hour stints, Lussier's students spent three full school days at the college, with the illusion of space flight broken up by the school bus ride home each afternoon.

At one point an exploration crew left the orbiter to ride in a van to 15 sites in the area to gather rocks and dirt to take back to earth for analysis. Another of the flight duties was to use a probe to gather data on a comet and return the information to the shuttle. Lussier, who was a passenger on the shuttle, had his students analyze the "comet" matter (some frozen mud) for the percentage of solid matter to liquid matter by boiling the water off in the orbiter's microwave oven.

Lussier's program is only the second time TEME has been used in a formal way by a younger student group. The first such project, a 24-hour simulation conducted this summer, involved Mexican and American students, all of whom had to work to overcome language barriers.

The results of the program so far have been mixed, LaRose says, and they point up the differences between two generations of video and computer users.

LaRose found the younger generation jaded about the superficial aspects of the simulated flight. The television monitors with the views of the capsule taking off and touching down, the computer screens that monitored the trip's progress, the flight panel with its blinking lights and numerous buttons and switches were seen as ho-hum stuff, and the children were generally harder to impress than their older counterparts.

"We found that these kids had grown up on high tech and the mass media, and to compete with Disneyworld was impossible," LaRose says. "We weren't 'Star Wars.'"

But if the razzle-dazzle components of the take-off needed some jazzing up to keep the attention of a younger audience, the computer programs needed to be simpler to operate.

"The first program was built on the idea that we needed a script," says Vouros. "To create a simulated environment, we had to create a structure for them to follow. We developed a main flight program that is basically a clock-driven script that includes a whole set of coded information to run the mission."

Other software includes a guidance and navigational program and the TEME biopack, a three-segment program that measures and records the flight crew's biomedical data and responses to stress, and a duty roster which schedules and records the different jobs during a flight.

"I think we learned that we have to modify the software so that two or three technical levels are built in. That way we can simplify the script when we want to," says Vouros. "Sometimes the problem is that we aren't successful in training the students because we get caught up in the technology."

Adds LaRose: "In order to be credible to these kids, the program has to be more sophisticated on the surface, but simpler to operate. It has to be like a good video game. And you have to have an experience where the teacher can raise the difficulty level."

In addition to simplifying the program for the children, Vouros and LaRose are working on simplifying the actual running of a simulation. The complexity of the network of computers, video monitors and electronics, which must be checked and synchronized, limits the number of times a simulation can be staged during the year.

One aspect of dealing with younger children, LaRose says, is that the span of skills within a particular age group of adolescents is markedly different than among college students. It often took longer for the younger students to grasp simple concepts, and their method of learning: the trial-and-error pushing of buttons and switches, often resulted in computer programs going awry.

"Eighth and ninth grade students have a wide range of cognitive skill levels and abilities," LaRose says. "We needed to provide more on-the-job training prior to liftoff than we ever had with the older students."

There were also problems that the typical middle school teacher sees every day: failure of some students to do their homework and prepare for their part of the mission, forgotten flight manuals, lunches, or the I.D.'s required to board the ship.

One of the things we like to teach is that students can be learning and having fun at the same time, but they have to take it seriously to do that," LaRose says. "But they didn't realize that they had to take the on-the-job training seriously to have a successful mission."

TEME has the potential to become a setting for learning about a variety of aspects of science: physics, astronomy, and earth science. But it also exposes students to a career path of the future, says LaRose. Despite the setbacks brought about by the space shuttle Challenger tragedy, LaRose says that the students who are now in middle school will see dramatic leaps in technology that will allow living and working in space.

"It will happen in their lifetime that people will be living and working in space," LaRose says. "There are a whole set of opportunities in their future that they could train for. They need to be made aware of the emerging technology."

Yet the secondary lessons to be learned by students participating in a TEME flight are distinctly low-tech and old fashioned: the importance of team work and cooperation, the role of preparation in achieving success, and the importance of leadership in any given endeavor.

"A successful mission requires a cooperative effort," LaRose says. "It means students must help each other, and when one doesn't know something, the other helps by teaching or explaining. Communication, the ability to allocate resources effectively, and leadership are all important dimensions to success, whether we're talking about driving a spaceship or any other endeavor."

In fact, Vouros says, any group of people which has to work together could learn from the TEME experience. He envisions the day when corporations will use the TEME shuttle for weekend simulations in which decision-making processes, leadership and team work skills could be studied by putting a team of middle managers in "space" and introducing a variety of stressors.

"You could have a bunch of actors in the actual module and the managers at the control panel would have to deal with impromptu events such as a machine malfunction, or a hostage-taking or a mutiny, for example," he says. "How would they respond to those things?"

Lussier says the experience of venturing into space has brought the class closer together and changed the student-teacher relationship in the classroom.

"It was well worth it to me," he says. "One spinoff is that it set up a relationship between me and the kids that I've never had before. They were responsible for taking me along on this trip, they were being active instead of passive. It seemed to set to the tone for the whole year, and the kids are more cooperative now. They're a lot more enthusiastic and willing to bring up things to look at rather than always waiting for me to do it."

--30--